Asymmetric SSNIPs:
Increasing any or all prices?[1]

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June, 2008

Preliminary draft

Abstract:
It is common to apply a SSNIP test with a uniform price increase on all products in the candidate market. We show that in situations with asymmetries – for example one product having a limited sale – a symmetric SSNIP test can suggest that the relevant market should include more products even though it could be profitable to increase the price of only one product in the candidate market. The bias could lead to type II errors in competition cases, where cases are cleared early on that should have been further scrutinized. Our results are illustrated with some findings from a survey in a local grocery market. We also show that the risk of the cellophane fallacy might be reduced by implementing asymmetric SSNIP tests.

[1]This represents our personal views, which is not necessarily shared by the Norwegian Competition Authority.

1. The introduction

Market definition has become the most important issue in almost all competition cases.[2] If markets are defined broadly, then there is typically no reason to have any antitrust concerns and therefore the case can be cleared without any further scrutiny. Since market definition acts as a screening device, one should be concerned about the potential for clearing a case that should not be cleared (type II errors). The SSNIP test was introduced in the 1982 US Merger Guidelines, and this method is currently used in most countries for defining relevant markets. It is often described as the hypothetical monopolist test, where new products are included in the candidate market until it is profitable to raise any or all prices in the candidate market with 5-10%.

In practice the SSNIP test is done by imposing a symmetric price increase on all products in the candidate market. However, this is not the only way it can be done.[3] Consider a candidate market with two products. The alternative to a symmetric price increase on two products would be a price increase on only one product. In a situation with identical sales and margins for those two products the price increase on only one product would be less profitable than a symmetric price increase. The reason is that the quantity that is picked up by the other product has a lower price if there is a price increase on only one product. Apparently, this suggests that the symmetric SSNIP test will always lead to narrower markets then the asymmetric SSNIP test. However, this is not true. We show that even with a rather modest asymmetry between those two products – for instance a rather small variation in sales – the symmetric SSNIP test may lead to broader markets than an asymmetric SSNIP test.

In many competition cases there are asymmetries between firms. For example, often a large firm acquires a smaller firm. We might expect that a merger would lead to a higher price increase on the smaller product, simply because the large product picks up a large fraction of the reduction in the sales of the smaller product. Such considerations are not taken into account in the SSNIP test the way it is applied in most competition cases.[4] On the contrary, it

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[2] See, for example, Baker (2007). He claims that market definition has been decisive for the outcome in more competition cases in the US than any other substantive issue.

[3] Note that in the 1992 US Merger Guidelines the phrase '*whether to raise the prices of any or all of the additional products'* is used (see page 7), indicating that a symmetric price increase on all products is not the only option.

[4] The method for applying the SSNIP test – the critical loss analysis – has with a few exceptions only considered a situation with symmetric prices and costs. Katz and Shapiro (2003) discussed the rationale behind a one-price

is common to assume a symmetric price increase on all products in the candidate market.[5] This bias in the application of the SSNIP test is illustrated with some findings from a survey of shoppers in a local market for groceries. It is shown that there are cases where a symmetric price increase for two outlets is unprofitable for a hypothetical monopolist controlling both outlets, while a corresponding price increase for only one of the outlets is profitable.

The symmetric SSNIP test is especially problematic in cases concerning possible abuse of a dominant position where the relevant market may establish a presumption of dominance. By definition there will be an asymmetry with a dominant firm competing against a small rival. A symmetric price increase will impose a price increase also on the dominant firm's product. Such a price increase can be unprofitable just because of the dominance itself. From a symmetric SSNIP test one might conclude that the relevant market should include more products, even though a price increase only on the small product could be profitable. A symmetric SSNIP test could therefore lead to what is called the cellophane fallacy, with markets being defined too broadly.

The potential for cellophane fallacy has led many to warn against applying the SSNIP test on cases concerning the possible abuse of a dominant position.[6] Although this is a quite natural conclusion for the symmetric SSNIP test, it should not apply for the asymmetric SSNIP test. On the contrary, the asymmetric SSNIP test does take into account the problems associated with imposing a price increase on a large product. This implies that an asymmetric SSNIP test may partly alleviate the problems associated with the most common application of a SSNIP framework in dominance cases. If a SSNIP test is applied, then the asymmetric SSNIP test should be the one used in those cases concerning abuse of a dominant position. In merger cases with large asymmetries involving a firm with a large market share the cellophane fallacy may also be relevant, and in such cases as well the asymmetric SSNIP test is more suitable than a symmetric SSNIP test.

SSNIP test. The criterion for a one-price SSNIP test was derived in Daljord, Sørgard and Thomassen (2008) and applied in Daljord, Sørgard and Thomassen (2007). Moresi, Salop and Woodbury (2008) introduce asymmetry by considering a multiproduct firm, but they stick to the symmetric SSNIP test.

[5] See, for example, Farrell and Shapiro (2008): *'In practice, Critical Loss Analysis typically assumes that the products are symmetric in price and costs, and studies only a uniform SSNIP imposed on all products.'*

[6] Note that the SSNIP test was introduced in the US Merger Guidelines, simply because we expect that in a pre-merger situation the risk of cellophane fallacy is rather limited. The European Commission has in its discussion paper concerning Article 82 warned against applying the SSNIP test on cases concerning a possible abuse of a dominant position (see European Commission, 2005).

The article is organised as follows. First we describe the all-prices and the one-price increase criterions for defining the relevant market, including an extension of the all-prices criterion to a market with asymmetries in sales for the products in the candidate market. Then we report some findings from a survey in a local grocery market in Norway, to illustrate the bias in the all-prices criterion, and we then discuss the implications of our analysis. In the last Section we offer some concluding remarks.

2. The criterions for market delineation

Critical loss analysis was first introduced in Harris and Simons (1989). They analysed the profitability of a price increase for a hypothetical monopolist in control of all sales of one product. In O'Brien and Wickelgren (2003) the analysis was extended to the case where a hypothetical monopolist controlled the sales of two products. They assumed a symmetric price increase, *i.e.*, an identical price increase for those two products, and derived the criterion for when such a price increase would be profitable. Let us denote those two products as i and j, and introduce the following notation:

α = Relative price increase

$L_i = (P_i - MC_i)/P_i$

$$D_{ij} = \frac{\partial q_j}{\partial p_i} \bigg/ \frac{\partial q_i}{\partial p_i}$$

L_i is the price-cost margin for product i, while D_{ij} is the diversion ratio from product i to product j. The latter is the fraction of the reduction in sales of product i that is picked up by product j following a price increase on product i. O'Brien and Wickelgren (2003) considered the symmetric case where $D_{ij} = D_{ij} = D$, and $L_i = L_j = L$. Given symmetry, they have shown that product i and j belong to the same market if:

$$D \geq \frac{\alpha}{\alpha + L}. \tag{1}$$

The right hand side is the critical loss, and identical to the critical loss defined in Harris and Simons for the case of only one product. This implies that the relevant market is defined if the critical loss is lower than the diversion ratio.

Note that *D* is the average of the two diversion ratios, and with symmetry an unweighted average (1) would strictly speaking be the following:

$$\frac{D_{ij} + D_{ji}}{2} \geq \frac{\alpha}{\alpha + L} \tag{2}$$

If asymmetry, we have to adjust the criterion. Let us assume that the price-cost margin is identical for those two products, but quantity sold is larger for one of the products ($q_i \neq q_j$). Then we have to take into account that diversion ratios may differ, and we have to adjust for differences in absolute size of the diversion. The criterion for product *i* and *j* belonging to the same market can then easily be adjusted to:[7]

$$s_i D_{ij} + (1 - s_i) D_{ji} \geq \frac{\alpha}{\alpha + L}, \tag{3}$$

Where $s_i = q_i/(q_i + q_j)$. The left hand side is the weighted diversion ratio, taking into account the asymmetries.

In Daljord, Sørgard and Thomassen (2008) it is argued that it is more natural to increase one instead of both prices if the asymmetry is sufficient large. In particular, it is natural to assume that the price of the 'small' product is increased. To understand this, think about a product with a much lower sale than the other product. A price increase of the small product will lead to loss in sales of this product, but a large fraction of the reduction in sales is picked up by the large product. If a hypothetical monopolist controls both products, it can then be profitable to raise the price of the small product. On the other hand, the small product may only pick up a very limited fraction of the reduction in sales following a price increase on the large product.

[7] See Daljord (2008) for the derivation of the criterion for a symmetric price increase. He derives the more general case with firms with different quantities of sales as well as different margins.

Let us assume that product i is the 'small' product, and that we have a price increase on only this product and not on the large product. It is shown in Daljord, Sørgard and Thomassen (2008) that with such an asymmetric price increase product i belongs to the same market as product j if:[8]

$$D_{ij} \geq \frac{\alpha}{L_i}. \tag{4}$$

Apparently, one would delineate markets more broadly if one applies the one-price criterion. This is easily seen if we assume that $L_i = L_j$ and $q_i = q_j$ and compare equations (1) and (4). Since $\alpha/L > \alpha/(\alpha+L)$ we see that the one price criterion in (4) is less easily satisfied than the criterion with a price increase on both products shown in (1). The driving force is the revenues from the sale picked up by the other product. If a price increase on both products, then the price on the sales picked up by the other product is higher than what is the case if a there is a price increase on only one product. Due to this it is more profitable with a price increase on both products than on only one product.

Although this is correct when considering a symmetric market, this is not necessarily true when considering an asymmetric market. To illustrate this, let us assume that product i is the 'small' product with a lower sale than product j. Furthermore, let us assume that diversion ratios are proportional to quantity sold. This is in line with the assumption often applied in merger simulations.[9] It is natural, because it is assumed that what a product picks up of lost sales of another product is proportional to the market shares.

From the proportionality assumption we have that $D_{ji} = D_{ij}s_i/(1 - s_i)$. Furthermore, let us assume that the absolute as well as the relative margins are identical on those two products. We can then rewrite the criterion for those two products belonging to the same market with a symmetric price increase:

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[8] The criterion was first reported in an earlier, unpublished version of O'Brien and Wickelgren (2003). Note, though, that in Daljord et al. (2008) the criterion is derived for the more general case of asymmetries in price-cost margins.

[9] See, for example, Epstein and Rubinfeld (2001). They impose proportionality in their PCAIDS merger simulation model. The same is true with the logit model, a model often used for merger simulations (see Werden and Froeb, 2002). Note that Willig (1991) argued that the logit model provides an appropriate benchmark for analyzing mergers. For a more detailed discussion of the proportionality assumption, see Werden and Froeb (2008).

$$D_{ij} \geq \frac{\alpha}{2(\alpha + L)S_i} \qquad (3')$$

Let us assume that (3') holds with equality. We plug D_{ij} from (3') into (4), and solve with respect to S_i. We have then found that the asymmetric SSNIP test leads to a narrower market if:

$$S_i < \frac{L}{2(\alpha + L)} \equiv S_i^*. \qquad (5)$$

This illustrates that the asymmetric SSNIP test leads to a narrower market definition than the symmetric SSNIP test if the asymmetry between those two products are sufficiently large.

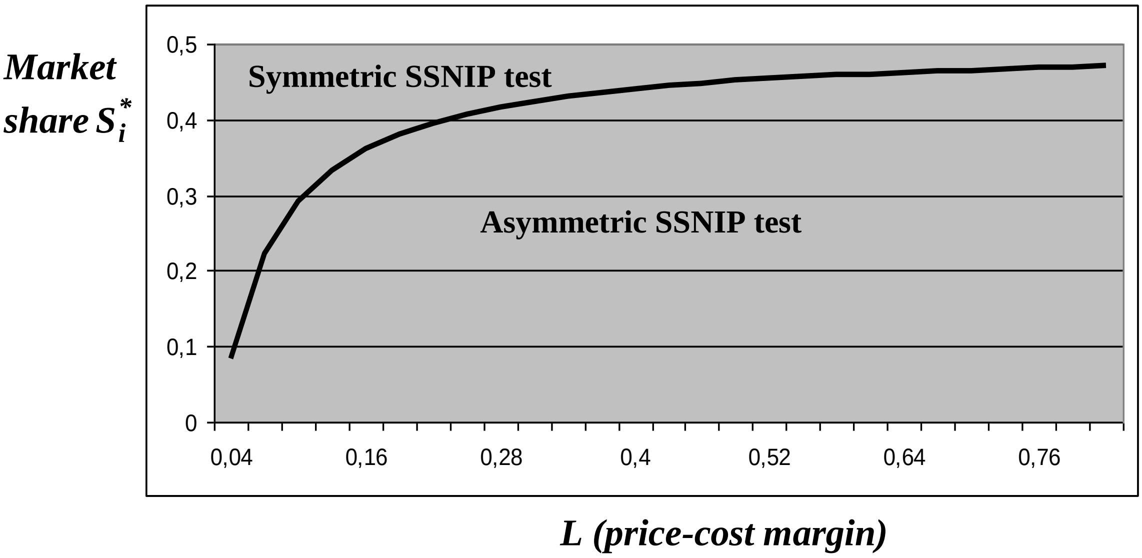

Figure 1: Which SSNIP test leads to a narrow market definition?

The solid curve shown in Figure 1 is the critical market share S_i^* defined in (5). It indicates that there is a large scope for the asymmetric SSNIP test leading to a narrower definition of the relevant market than the symmetric SSNIP test. For example, let us assume that L = 30 % and α = 5 %. We find that with these assumptions the asymmetric SSNIP test will lead to a narrower market definition if S_i < 42.8 %.

To illustrate the difference between those two criterions, let us further elaborate on our numerical example. When L = 30 % and α = 5 % the critical loss is the following, depending on whether one considers a symmetric price increase or a price increase on only one product:

One-price increase: $\frac{\alpha}{L} = 16.7\%$

Symmetric price increase: $\frac{\alpha}{\alpha + L} = 14.3\%$

We see that the critical diversion ratio is higher for the one-price increase test, which confirms what we explained concerning the symmetric case. Let us now assume that the quantity sold of product j is four times higher than for product i. Given the proportionality and that the sales of product j is four times higher than the sales of product i, we have that $D_{ij} = 4D_{ji}$. Let us set D_{ij} = 20 %. Assuming proportionality, we have that D_{ji} = 5 %. We can now find the following diversion ratios for a one-price and a symmetric price increase, respectively.

One-product price increase: $D_{ij} = 20\%$

Symmetric price increase: $R_i D_{ij} + (1 - R_i) D_{ji} = 0.2 \cdot 0.2 + 0.8 \cdot 0.05 = 8\ \%$

These two expressions should be compared with the critical loss we defined above. We see that the relevant market is not defined if we apply the symmetric price increase. The weighted diversion ratio is only 8 %, while we have shown above that the critical loss is 14.3 %. Then we have to include more products than product i and j to conclude that the relevant market is defined.[10]

If we apply the one-product price increase on the small product, we see that the diversion ratio is 20 % while the critical loss has been shown to be 16.7 %. This implies that it is profitable to increase the price of product i, and the relevant market consists of product i and product j.

[10] If we had not adjusted the criterion for the symmetric price increase, we would have overestimated the true diversion ratio. An unweighted diversion ratio would be equal to 12.5 %. This is clearly wrong, because the diversion ratio from the small product to the large product would have the same weight as the diversion ratio from the large to the small product.

Let us also check for a one-price increase on the large product. We see that the diversion ratio is 5 %, which is lower than the critical loss of 16.7 %. It implies that if we start with product *j* and add product *i*, then we have to add at least one more product to define the relevant market.

4. An application: A local grocery market in Norway

In our model we imposed a particular asymmetry by assuming proportionality. It is an empirical question how asymmetries do play out in a particular case. A recent study from a local grocery market in Norway illustrates that there might be substantial asymmetries concerning diversion ratios, and that the choice of test matters for the market definition.

Voss is a village in the Western part of Norway with several grocery outlets, with a long distance to other outlets. This implies that we can safely conclude that the geographical market does not consist of more than those grocery outlets at Voss. These grocery outlets are of different size. Let us consider the eight largest outlets, with a joint market share of 90.8 % of annual turnover. The market share of the largest one is approximately three times the market share of the eight largest outlet, which illustrates that we do have quite large asymmetries.

Halleraker and Wiig (2008) report the results from an empirical study of the grocery market at Voss. They conducted surveys of 800 shoppers, approximately 100 shoppers outside each of the eight outlets. Among other questions, they asked each shopper which outlet they would have chosen if this outlet was not available. Then they revealed each shopper's second choice. The information from all the shoppers was aggregated to find the revenue diversion ratio, *i.e.*, how large fraction of the revenue at one outlet that was diverted to another specific outlet. Since they did so at all eight outlets, they could estimate diversion ratios in both directions for each pair of outlets. This made it possible to detect any asymmetry in diversion ratios. Figure 2 report the diversion ratios for each pair of outlets.

If we assume that the price-cost margin is 25 % and the price increase 5 %, then we know that with a symmetric price increase the critical diversion ratio is 16.7 %. The critical diversion ratio is illustrated with the thick dotted lines in Figure 2. Since there are eight outlets, there will be 56 different pairs of outlets. The diversion ratios in both directions for each of them are shown in the Figure with a square mark. If we have a square mark on the 45^0 line, then the diversion ratios for a pair of outlets are symmetric. We see that there is a large variation, and notably some of the square marks for the pair of diversion ratios are located far away from the 45^0 line. This makes it natural to check whether an asymmetric SSNIP test will lead to a narrower market definition in any of these cases.[11]

We see that many pairs of outlets are in the South-East rectangle in the Figure, which implies that they have low diversion ratios in both directions. In those cases we can conclude that the relevant market consists of more than those two outlets.

We see that three pairs of outlets are located in the North-East rectangle in Figure 2, with high diversion ratios in both directions. Then we can conclude that each of those pairs of outlets can define the relevant market.[12] Each of them is marked with a large square mark.

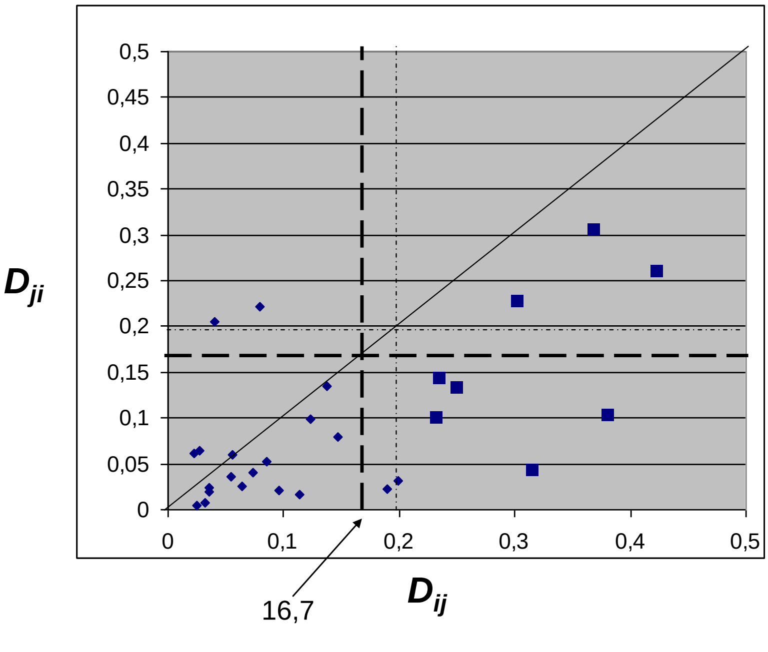

Figure 2: Diversion ratios for each pair of outlets

[11] In theory we could also have that the asymmetric SSNIP test would lead to a broader market. However, it can easily be verified that this is not the case in any of the examples shown in Figure 2.

[12] Note, though, that when defining the relevant market we check for the lowest number of products that must be included for a price increase being profitable. In our case we could have that some of the four pairs in the North-East rectangle are overlapping. Then we should proceed by considering which one is the candidate market. For example, in a merger case we know which outlets that are directly involved. We should then start with this pair and check whether they belong to the same market, and proceed until we have defined the relevant market.

In the North-West and the South-East rectangles, though, we have to look more closely to check whether the actual diversion ratio exceeds the critical one. In line with the previous analysis, with a symmetric price increase we have to weight each diversion ratio with the corresponding market share in order to find the adjusted revenue diversion ratio. If we do that, we find that each pair of outlets shown with a large square mark in Figure 2 can be defined as a relevant market.

We see from Figure 2 that there are nine pairs of outlets in the rectangles in the North-West and the South-East of the thick dotted lines. According to the symmetric test, in five of these nine cases the relevant market is defined. Each of them is shown with a large square mark. However, the question is whether any of the remaining four pairs can be defined as a relevant market according to the asymmetric test. The critical diversion ratio in the asymmetric test is 20 %, and shown with the thin dotted lines in Figure 2. It turns out that two of those four pairs, the two in the South-East rectangle, are not defined as a relevant market even with an asymmetric price test. The remaining two, in the North-West rectangle, are defined as a relevant market if we impose an asymmetric price test. In those two cases there is thus of importance whether we impose a symmetric or an asymmetric price test.

5. A discussion

Although the criterions as such interpreted in the symmetric case should suggest that the one-price criterion leads to broader markets, we have shown that the opposite can be true. The intuition for this is quite straight forward. If one increases the price on the large product, only a small fraction of sales is expected to be picked up by the small product. On the other hand, it is plausible that the large product can pick up a large fraction of lost sales for the small product. This was exactly what we took into account in our model when we let the diversion ratios be proportional to the size of the products. Then it is quite natural that a price increase on the small product is more profitable than a price increase on the large product.

Our numerical example following Figure 2illustrates that we can have an asymmetry in market definition. In our numerical example we found that if we start with product *i* then by including product *j* only we have defined the relevant market. On the other hand, if we start with product *j* we find that the relevant market is not defined if we only include product *i*. The reason is that product *i* is such a small product, that product *j* still faces many competitive constraints from other products even if it could control product *i*. Then product *i* is in the same market as product *j* only, while product *j* is in the same market as product *i* and at least one more product. However, this is quite easy to understand when we take into account the basic idea behind an asymmetric SSNIP. It illustrates that it can be profitable to raise the price of the small product as long as one controls a large product, while the owner of a large product must control many small products to be able to raise the price on the large product in a profitable way.

An asymmetric SSNIP will in many cases be relevant. For example, a firm with large sales acquires a firm with a smaller sale. The main concern could then be that the small firm's product price would increase after the acquisition. By imposing a symmetric price increase on the two products, one might wrongly conclude that the relevant market is larger than the two products. Imposing a one-price SSNIP test in the initial candidate market consisting of those two merger candidates' products would reduce the scope for type II errors. If the asymmetric price increase is not profitable, then a third product should be included and a one-price SSNIP test repeated. The results from the survey in the grocery market did indeed show that the test can make a difference. We have shown that in two cases, with two different pairs of outlets as the candidate market, the relevant market is defined if we apply the asymmetric SSNIP test but not defined if we apply the symmetric SSNIP test.

In merger simulations it is well known that a merger between a small and a large firm would lead to a larger price increase on the small than on the large product. This insight should also be taken into consideration in the market definition. If not, one risk that cases where the price of one or some (but not all) products would rise substantially after a merger is cleared before any assessment of the anticompetitive effects. The same is true in case with a possible abuse of a dominant position. By definition we have a large firm, and imposing a price increase on a firm with such a strong position in the market could in many cases lead to what is called the cellophane fallacy.

One could argue that a price increase on only one product, and the smallest one, might imply that the anticompetitive effect is of a limited magnitude. If so, applying an asymmetric SSNIP test would lower the threshold level for concluding that two products are in the same market. The threshold level should be that a 5 % price increase on all products is profitable. However, such reasoning can be flawed. A price increase on one product can then be neglected simply because that product was compared with another and larger product when the symmetric SSNIP test was done. The relevant question is whether the consequences of an anticompetitive price increase are of sufficient absolute magnitude that it should trigger any action by the competition authority.

5. Some concluding remarks

Market definition is crucial in most competition cases, and the SSNIP test is the accepted method for defining the relevant market. This should call for a careful investigation of how the SSNIP test is performed. Although asymmetries in prices and costs between firms obviously is more often the rule than the exception in markets, in almost all SSNIP tests a symmetric price increase is imposed. This might lead to the relevant market being defined too broadly, which implies a risk of type II errors: clearing cases that should have been scrutinized further. Moreover, the symmetric SSNIP test is not well suited for the cases of possible abuse of dominance. This is well recognized and has led to a warning against the SSNIP test in those cases. However, a better response is to apply the asymmetric SSNIP test rather than abolishing the whole idea of a SSNIP test in those cases.

Although market definition has become the most important issue in most competition cases, it is not a goal in itself. Our primary concern should be whether there are any possible anticompetitive effects, for example whether there will be a substantial price increase following a merger or a substantial price increase following a predation. One natural response to this would be that the market definition should be performed in such a way that it is in line with what we expect would be the most plausible anticompetitive effect. When choosing between a symmetric and an asymmetric SSNIP test in a particular case we should therefore be guided by how we anticipate that the anticompetitive effect could be played out. This calls for a SSNIP test based on economic reasoning, rather than imposing a symmetric SSNIP test in a mechanic way.

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